THE NASA EXPERIMENTAL PROGRAM TO STIMULATE COMPETIVE RESEARCH (EPSCoR). E. J. Dasch[1] and E. B. Ward[2], [1]NASA Space Grant/EPSCoR Program, NASA Headquarters, Code FE, Washington, D.C. 20546 j.dasch@hq.nasa., [2]NASA Space Grant Program, Mail Stop 221 NASA Langley Research Center, Hampton, VA 23681 e.b.ward@larc.nasa.gov

At the request of Congress, NASA initiated its version of an Experimental Program to Stimulate Competitive Research (EPSCoR) in 1994 with five year awards to six states. These state awards, administered from NASA Headquarters Office of Human Resources and Education include a grant of $500 K per year for a three year period with a two year renewal option. The six original EPSCoR awardees were university-based consortia from Alabama, Arkansas, Kentucky, Louisiana, Montana, and Puerto Rico. In 1996, NASA held its second round of EPSCoR competition. It resulted in awards to four additional state consortia: Kansas, Nebraska, Oklahoma, and South Carolina. The ten total NASA EPSCoR awardees are simultaneous participants in the Space Grant Capability Enhancement program. Both types of consortia are jointly administered by university faculty from the lead academic institution and both programs often have the same institutional constituents. With continued or increased funding from Congress, NASA plans to expand its EPSCoR program to all of the eligible states.

The NASA EPSCoR precursor, also administered by the NASA Office of Human Resources and Education, the Space Grant Capability Enhancement program, began operation in 1991 and currently serves 17 states with five year awards of approximately $200 K. Both programs target states of traditionally weak research infrastructure with funds to develop a more competitive research base. The Capability Enhancement grant carries a financial award to students component, in the form of scholarships and fellowships. Capability Enhancement states may also use some of their grant funds to further precollege and higher education projects at participating institutions.

Conceived as a more exclusive research enhancement vehicle, NASA EPSCoR grant awards go to university projects closely related to one of NASA's four strategic enterprises: Aeronautics, Human Exploration and Development of Space, Mission to Planet Earth, and Space Science. EPSCoR scientists frequently collaborate with NASA's field installations and Centers of Excellence. EPSCoR consortia foster cooperation among departments, across institutions, with state and local government, and with business and industry. In addition to strengthening the research base of the state's academic institutions, EPSCoR outcomes include the transfer of developed technology to industry, the increased economic development of the participating states, and the communication of the benefits of research to the public. The NASA EPSCoR states emphasize the participation of underrepresented groups in all facets of their operations.

To date the EPSCoR program has demonstrated much success. After only two years as EPSCoR grantees, the first six NASA states collectively accomplished the publication of 225 papers in peer-reviewed media; acquired $62 Million in additional research grants from federal and non-federal sources; were granted one patent and applied for many more; and secured the participation of 42 institutions with hundreds of students and faculty. In addition to these results, the six states collectively proposed for another $15 Million and produced another 287 publications in the form of student theses, dissertations, conference presentations, and so on. The results seem to indicate that these states will emerge from this experimental program with a stronger research base and an increased capacity for winning non-EPSCoR R & D funding.

Though there are many partnerships that have resulted from NASA EPSCoR projects, several examples illustrate the potential economic benefit to the states. In Montana researchers from universities, industry, and NASA are working together on a common problem, the development of an innovative product to calibrate field instruments known as Optical Spectrum Analyzers (OSAs). This collaboration resulted directly from the participation of a Montana Space Grant undergraduate student in Montana EPSCoR interdisciplinary research. Typical OSAs measure the wavelength of a signal in fiber optics to a precision of 0.1 nanometer. Inevitably, the instruments lose their calibration and have to be returned to the factory for recalibration. The undergraduate student spent his NASA funded research time developing a new calibration tool that can be used "in the field." Three separate Montana EPSCoR companies are collaborating on the manufacture of this new instrument.

In Puerto Rico an EPSCoR funded project seeks to understand land and sea interactions with the atmosphere. Some of the remote sensing applications developed in pilot projects have been expanded to study forests and volcanic eruptions. Researchers have benefited from the use of satellite images coming from the Coastal Zone Color Scanner (CZCS). The scanner make its possible for researchers to study the chlorophyll content of local coastal waters.

In Kentucky, one EPSCoR project began with the recognition of a need for chemical sensors to detect contaminants in recycled water in space human habitats such as International Space Station. A young researcher in the University of Kentucky's Department of Chemistry began to develop chemical sensors with the assistance of a graduate student supported by a fellowship from the Kentucky Space Grant Consortium in 1993. Later that year, the researcher, a departmental colleague, and a collaborator at the regional Western Kentucky University, successfully proposed a primary research cluster in chemical sensors for inclusion in the inauguration of the Kentucky NASA EPSCoR Program.

In two years of NASA EPSCoR funded research, the cluster has developed a variety of chemically-specific detection methods, involving a wide range of science and technology including chemistry, physics, and bio-engineering. The results have led to involvement in the NASA Sensors 2000 project and to the development of a basis for biocom-

patible sensors incorporating an anti-coagulant to permit implantation for medical applications.

The chemical sensing techniques that are being developed have far-reaching applications in the national interest in areas ranging from water quality and environmental issues to applications in geology and in health, as evidenced by subsequent grants from the USGS, DOE, and NIH. Benefits to nationally-significant science and to the development of human resources are strongly evident in the project. One young faculty researcher received the NSF CAREER Award. Thus far, 6 faculty members, 11 graduate students, and 4 undergraduate students have been involved, resulting in 54 scientific publications and presentations. In 1996, the cluster efforts expanded under Kentucky NASA EPSCoR funding to include collaboration by a new African American faculty member in the Chemistry Department and by a member of the Department of Electrical Engineering.

The previous examples underscore the potential of the NASA Experimental Program to Stimulate Competitive Research. The benefits reach beyond the university to the state and the nation--to the taxpayers and legislators that make the program possible.